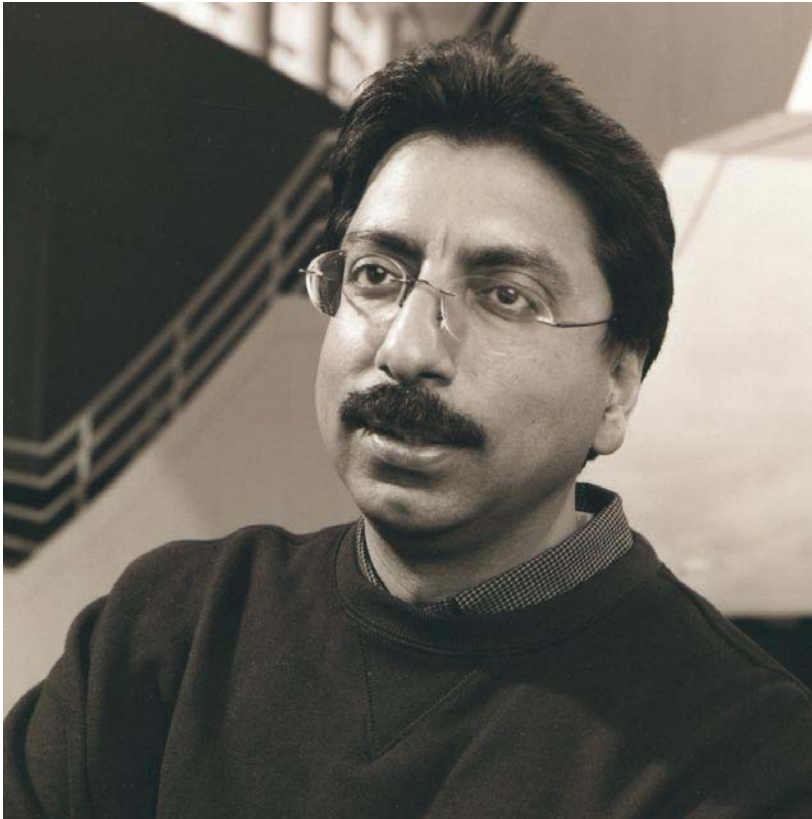




Gopal Gupta

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Computer Science

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Research Interests

- Programming Language (Implementation and Semantics)
- Compilers, Compile-time Analysis, Static Analysis
- Internet Markup Languages
- Assistive Technology and User Interfaces
- Logic & Constraint Programming
- Parallel/Distributed Processing

Education

- Ph.D., Computer Science, The University of North Carolina at Chapel Hill (1991)
- M.S., Computer Science, The University of North Carolina at Chapel Hill (1987)
- B.Tech., Indian Institute of Technology, Kanpur, India (1985)

"I joined UTD six years ago. What drew me to UTD was its vast potential to be a great university that can rival the best in the world. UTD's emphasis on science and technology, its location in a vibrant metropolitan area rife with high-tech companies, its excellent faculty and students, its infrastructure and resources, were all very positive signs. In fact, I did not see a single reason why UTD could not achieve its lofty goal then, and I do not see a single reason now, as UTD makes giant strides towards achieving this goal."

Professional Highlights

Dr. Gupta is a Professor in the Department of Computer Science and Director of the Applied Logic, Programming Languages, and Systems (ALPS) Laboratory. He has published more than 100 papers in refereed journals and conferences in areas of programming languages, parallel processing, logic programming, and assistive technologies. Dr. Gupta has produced several research software systems, some publicly distributed, and has been awarded more than two dozen research grants totaling more than \$8 million from agencies such as the National Science Foundation (more than a dozen grants), the Environmental Protection Agency, the Department of Education, the Department of Energy, the National Research Council, and the North Atlantic Treaty Organization (NATO). He is a member of the Editorial Board, *Theory and Practice of Logic Programming*, an executive board member of the Association for Logic Programming and the European Association on Programming Languages and Systems, and the Founder/Coordinator of COMPULOG Americas, a network of logic/constraint programming research groups. Dr. Gupta and his students have received several Best Paper Awards, most recently at the 2nd European Conference on Web Services in 2005.

UNIVERSAL SERVICE-SEMANTICS DESCRIPTION LANGUAGE (USDL)

For Web Services to become more practical an infrastructure needs to be supported that will allow users and applications to discover, deploy, compose, and synthesize services automatically. This automation can take place only if a formal description of the Web Services is available. In this project, together with Metalex Corporation, Dr. Gupta's team is developing an infrastructure for Web Services based on the Universal Service-Semantics Description Language (USDL), a language for formally describing the semantics of Web Services. USDL is based on the Web Ontology Language (OWL) and employs WordNet as a common basis for understanding the meaning of services. USDL can be regarded as formal service documentation that will allow sophisticated conceptual modeling and searching of available Web Services, automated service composition, and other forms of automated service integration.

LOGICAL SPREADSHEETS

Dr. Gupta's team is adapting the spreadsheet paradigm for solving a large class of constraint satisfaction problems. Solutions of many such problems, including scheduling problems, timetabling problems, and recreational puzzles can be represented as a table. The constraints that need to be set up (and solved) for such tabular problems are fairly regular in nature and naturally fit into the spreadsheet paradigm of programming. The team is working on melding the two paradigms of Constraint Logic Programming with Finite Domains [CLP (FD)] and spreadsheets to produce a

system that allows non-expert users to solve complex constraint satisfaction problems.

DYNAMIC AURAL WEB ACCESS

One frontier of research for the Web is to make it universally accessible via both audio and voice. A voice/audio accessible Web will not only make it more accessible to people who are visually impaired; it will also permit novel applications of the Web to be developed, such as those used for e-commerce over cellular phones. Dr. Gupta's solution relies on VoiceXML, a standard for marking-up documents so they can be browsed aurally. To make the current HTML-based Web aurally navigable, two issues need to be addressed: (1) HTML should be automatically translated to VoiceXML; and (2) users of the voice/audio Web should be able to freely aurally navigate the VoiceXML document. Dr. Gupta's team is developing solutions to address these issues in order to obtain a truly interactive voice and audio accessible Web. The technology being developed is also useful for automatically generating interactive "talking books" once they have been published on the Web.

BUFFER OVERFLOW ATTACK-PROOFING CODE BINARIES

About 60% of attacks over networks exploit the *buffer-overflow vulnerability*, a flaw that is present in a software system due to the negligence of its developer. Dr. Gupta's team is developing a system that will transform a code binary in such a way that the code will no longer be vulnerable to a buffer-overflow attack. The advantage of an approach based on transforming code-binaries, in contrast to other approaches, is that the source code of an application is not needed. A prototype system has been developed and is operational.

STATIC ANALYSIS OF CODE BINARIES

Dr. Gupta's team is developing tools and techniques for checking if a code-binary is reusable. They have developed necessary and sufficient conditions for ensuring that software binaries are reusable and have related them to coding standards that have been developed in the industry. These coding standards discourage both the use of hard-coded pointers and the writing of non-reentrant code. Checking that binary code satisfies these standards/conditions, however, is generally undecidable. Dr. Gupta's team is developing static analysis-based methods for checking if a software's binary satisfies these conditions. They have applied their approach to analyze the presence of hard coded pointer variables in assembly code obtained from binaries of digital signal processing applications.

NEXT GENERATION OF REASONING ENGINES FOR THE SEMANTIC WEB

Applications for the semantic Web will require fast and sophisticated reasoning engines. Dr. Gupta's team is developing general-purpose reasoning engines that are based on logic programming and its extensions.